Phase Transformations and Structural Relaxation Processes in Supercooled Mesogenic /-p-Aminoxybenzylidene/p-Toluidine/

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The developments of phase transitions and structural relaxation processes were investigated in vibration Raman spectra under slow heating of supercooled /-p-aminoxybenzylidene/p-toluidine/ (ABT).

A sample of ABT heated to the isotropic liquid state (T=343 K) was coated in liquid nitrogen (T=78 K). Then it was heated at a rate of 2 K/min, and Raman spectra in regions 1150-1210 cm^{-1} and 1550-1650 cm^{-1} were measured. It was found that Raman bandwidths of supercooled liquid crystals coincide with same parameters of nematic and isotropic liquid. Then at T~220 K amorphous object is transformed into crystal. It is developed in narrowing of bands.

For study of the dependence of crystallization temperature with thermal pre-history, the annealing of supercooled sample at two temperature points (T=198, 210 K) with simultaneous registration of Raman spectra. was made. The exponential time dependence of bandwidths with characteristic times (τ) ~7.2×10^{3} c (T=198 K) and ~1.5×10^{4} c (T=210 K). was obtained. Using these values and taking into account the Boltzmann-Arrhenius equation: $\tau=B\cdot exp(U/kT)$, the activation energy ($u=UN_A$=21 kJ/mol) of amorphous state-crystal relaxation process and time (B=4.0×10^{-2} c) of attempt of structural elements for potential barrier overcoming was estimated. It allowed the curve of structural relaxation time temperature dependence around region of amorphous state crystallization to be obtained